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VALUATION DISPARITIES AND ENVIRONMENTAL POLICIES*

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The empirical evidence collected over the past several years seriously contradicts the common assumption of equivalence between alternative economic measures of environmental losses on which many environmental policies are based. For example, the proportions of respondents in a random Ontario household survey who said they would be willing to sacrifice $100 per year to "maintain fish populations in the Haliburton and Muskoka regions" from adverse impacts of acid rain, varied from 82 per cent to only 46 per cent depending on which of the two available measures was used. Nearly twice as many people valued the loss at more than $100 on the basis of a willingness to forego this much of a "reduction in direct and indirect taxes and prices," than were willing to pay this same amount in higher prices and taxes.

The accepted measure of economic value is what people are willing to sacrifice: gains are assessed by how much individuals are willing to pay to attain them, losses by the minimum compensation necessary to leave individuals as well off as they would be without the change. While the definitions of gains and

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losses differ, in practice environmental assessments and policy prescriptions are commonly based on the empirical assertion that measures of willingness to pay and to accept compensation will yield equivalent valuations; that, "practically speaking, it does not appear to make much difference which definition is accepted" (Freeman, 1979, p.3).

The finding of the very large difference between the willingness to pay and the compensation demanded valuations of fish losses in the Ontario survey is typical of the results of other studies. Examples of the reported findings, including several involving environmental values, are summarized in Table 1. This evidence suggests that environmental losses will usually be greatly understated when assessed by the willingness to pay measure rather than the more appropriate compensation demanded measure.

Although the results from numerous surveys and other controlled tests have indicated that large differences in the values can usually be expected, these findings have had little or no discernible impact on environmental analyses or policies. Losses as well as gains continue to be assessed for policy and planning purposes on the basis of the payment measure. This hesitation to take the disparity evidence seriously may be encouraged by the pragmatic consideration that: "Generally speaking, willingness to pay is easier to estimate than required compensation" (Kneese, 1984, p. 15), but for whatever reasons there remains a strong

reluctance to change long standing conventional practice. The practical guide remains that: "The willingness-to-pay approach still holds: the true costs of unfavorable impacts are the total amount that people would be willing to pay to avoid them" (Stokey and Zeckhauser, 1978, p. 152).

Table 1. Summary of Past Tests of Disparity Between Willingness To Pay (WTP) and Willingness To Accept (WTA) Measures of Value.

Study	Asset or Good	WTP	WTA	Ratio
Hammack and Brown (1974)	Marshes	$247	$1044	4.2
Sinclair (1976)	Fishing	35	100	2.7
Banford, et al (1977)	Pier	43	120	2.8
	Postal service	22	93	4.2
Bishop and Heberlein (1979)	Goose hunting	21	101	4.8
Brookshire, et al (1980)	Elk hunting	54	143	2.6
Knetsch and Sinden (1984)	Lottery	1.28	5.18	4.0
Heberlein and Bishop (1985)	Deer hunting (hypoth.)	31	513	16.5
	Deer hunting (real)	25	172	6.9
Brookshire/Coursey (1987)	Trees in Park	10.12	56.60	5.6

The contrast between the accumulating evidence of a systematic and large asymmetry between the value of gains and losses and the "business as usual" rule of current analysis practice and policy design, suggests at least two lines of further study. The first might usefully be directed to further tests of the disparity, using varied experimental and survey designs to better assure that past results are not artifacts of the study designs used and to determine the extent to which disparities persist over repeated valuations and occur with varied kinds of entitlements. The second line of study might explore policy and analysis implications of any disparities.

Tests of The Disparity

The conventional assertion of valuation equivalence is based on the assumption that people assess gains and losses by comparing the value of end states. That is, comparisons between how they feel with their present wealth, for example, and how they would feel with their present holdings less $10; or between their well-being with present entitlements with a bit more or a little less pollution. However, this is not an accurate description of how people value most changes. Instead of comparing alternative end states, people usually evaluate gains and losses in terms of changes from some reference position. And they value losses from this neutral point much more than they do gains to it (Kahneman and Tversky, 1979).

This asymmetry in valuations of gains and losses, or endowment effect, is readily apparent and easily demonstrated by people's choices between simple gambles (from Kahneman and Tversky, 1988). For example, when asked to choose between the following two options:

A. An equal 50 per cent chance either to win $30 or win $15

B. An equal 50 per cent chance either to win $45 or win $5

a large proportion of people pick B over A -- the 50 per cent chance to win a $15 larger prize more than makes up for the same chance to win $10 less on the down-side. However, when asked to choose between similar options, but with $20 subtracted from each sum so that the down-side is in the domain of losses:

C. An equal 50 per cent chance either to win $10 or lose $20

D. An equal 50 per cent chance either to win $25 or lose $15

a significant shift to a preference for C over D normally occurs -- the 50 per cent chance to win $15 more does not in this case compensate for the same risk of a $10 greater loss. Because losses are valued more than gains, larger positive payoffs are necessary to offset the same difference in the adverse outcome when the unfavourable outcomes mean greater losses rather than just smaller gains.

Comparable aversion to losses appears to be responsible for the disparities between valuations of losses, such as those reported in Table 1.

Earlier studies found large valuation disparities whether hypothetical survey questions or real money exchange experiments were used. The original findings of differences were not due to the hypothetical nature of the evaluations, as suggested by some (for example, Dwyer and Bowes, 1978). More recent research has provided further tests of the influence of transaction costs on the findings and on the persistence of the value differences over repeated valuations (Knetsch, Thaler and Kahneman, 1988). Again, the results were much the same.

Another more recent experiment has provided a still more severe test of the valuation disparity by allowing continuous bargaining between potential buyers of a good who have each been given a windfall gain of money and potential sellers who have been received either much smaller sums or no money. Previous research has shown that there is a strong tendency for people to spend or give up such unanticipated gains, or "house money" in gambler's parlance, much more easily than their "own" money (Thaler and Johnson, 1988). Consequently, buyers who have been given such sums might be expected to be willing to pay larger amounts to acquire a good than they otherwise would; and such a willingness to give up more money to acquire the good would lead to more equal valuations of buyers and sellers.

The experimental test was carried out in two steps. Participants were randomly divided into pairs, and one member of each pair was first given an asset that could be traded to the

other person at any price that they agreed upon. The redemption value of the asset to each participant was previously prescribed by the experimenter and was deliberately arranged so that an advantageous trade could be made that would result in one party obtaining a far greater "profit" than the other. The person receiving the larger payoff from the first induced value market then became a potential buyer in a second market, conducted under identical rules, for a real good that was initially given to the other person in each pairing.

The results again demonstrated that losing a good is valued more than gaining the identical entitlement. Even when potential gainers were provided an the added incentive of giving up nearly pure windfall gains to acquire a good, they demonstrated that they overwhelmingly valued the good less than the people who had the original entitlement (Thaler, Knetsch, and Kahneman 1988). The buyers were still systematically willing to pay less for these assets than sellers demanded for the objectively identical rights.

A variety of different experimental designs have now been used to test the equivalence assumption and the persistence of observed disparities (Knetsch, Thaler, and Kahneman, 1988). The evidence provided by the results indicates that, contrary to traditional assumptions and conventional practice: losses are valued far more than gains, the differences are pervasive and large, the disparities are not attributable to wealth effects, the dis-

parities are likely to persist over repeated valuations, and they are not the result of avoiding transaction costs or strategic behaviour.

Research on Implications of the Disparity

The evidence strongly suggests that the conventional presumption of valuation equivalence may be a poor description of actual behaviour and may well lead to misleading assessments, inappropriate policy decisions, and resource misallocation. This apparent dependence of valuations on entitlements raises some question about the general propriety of various common economic assertions which are based on the presumption of value equivalence. A substantial number of these involve the economic analyses of environmental problems and the design of environmental policies.

Measurement of Losses

The valuation disparity findings suggest that most economic assessments of environmental losses will be seriously understated and decisions may be biased because of this.

Although most environmental management and policy decisions are not based on comprehensive and explicit estimations of economic costs and benefits, an awareness and appreciation of the economic consequences of alternative actions usually plays a significant role in formulating options and choosing among them. It is common, for example, to base choices on some notion of what people seem to be willing to pay to obtain or to keep some asset or entitlement, or to avoid some form of environmental degradation. However, if the contemplated change imposes losses on individuals, or if it involves an action that will reduce their loss, then this usual practice will almost certainly greatly understate the values involved. As a consequence, too many environmentally disruptive projects will be encouraged, too many harmful activities will be allowed, inadequate mitigation measures may be undertaken when environmental values are at risk, and compensation for losses may be inadequate.

Another frequently omitted and otherwise understated cost is the loss imposed on people due to the risk or uncertainty of the consequences of an action. For example, many of the physical impacts of waste disposal or damages due to pollutants are often unknown. And this uncertainty itself is a cost as people indicate a willingness to sacrifice other things to be free of it. These sacrifices are as much expressions of economic value as damages to buildings or reduced yields of crops.

To the extent that uncertainties are adverse changes imposed on people, these losses are then best measured by the minimum compensation necessary to leave people as well off as they are without the uncertainty -- the compensation demanded measure. An accounting of the sums people are willing to pay to be rid of the

risk would likely greatly underestimate these costs.

Similarly, environmental control standards will systematically be set at inappropriate levels if losses are assessed by the willingness to pay measure.

In an analogous way, liability for damages may be inappropriately assigned and thereby discourage fully justifiable levels of protection from environmental and other harms. The standard of reasonable care is often used as a guide for the efficient resolution of conflicts. If the expected damages from an action (that is, the probability of occurrence multiplied by the value of the loss if it occurs) exceed the cost of avoiding an accidental loss, a ruling of liability for damages will encourage cost justified precautions; if the cost of avoiding further injuries is greater than the expected loss, then the present standard of care is judged to be reasonable and the denial of damages will discourage precautions which are not cost justified. However, this criterion of when precautions are or are not justified is critically dependent on the measure of loss. More damaging activities and fewer preventative measures will be undertaken with the use of the willingness to pay measure of loss than would be the case with the usually more appropriate compensation measure.

The pervasiveness of valuation disparities may also alter the preference between mitigation measures and compensation as

alternative remedies to deal with environmental harms or losses. The conventional economic analysis suggests that, all other things equal, compensation will normally be the more efficient and preferred means to deal with losses. The advantage is assumed to be the lack of restrictions attached to a compensation payment, which permits recipients to use the funds for whatever good or service they value most. An equal sum spent on mitigation would restrict recipients only to the benefits of reducing the harm -- which may or may not be of much importance and value to the people affected.

The disparity findings suggest an alternative view of the relative merits of compensation and mitigation. Compensation may be viewed by people as two events: a loss associated with the harm, and a heavily discounted gain of a money payment. A mitigation measure, on the other hand, may well be treated as reducing the loss associated with the harm, and will consequently be regarded as being more important.

The strength of this intuition has been borne out by the results from some preliminary surveys indicating that affected parties may well value mitigation or replacement measures more highly than compensation payments, even when the sum of the payments exceeds the expenditure on the mitigation works or when the mitigation seems to serve little beneficial purpose. For example, slightly over half of student respondents preferred to have an accidently destroyed old textbook which had been used in an

earlier course replaced rather than receive the cash that they could then use for another currently needed text or for any other purchase. They expressed the same preference for replacement of a paperback novel which they had already read, even though this would appear to have less value to them than other things -- including a new novel -- they could buy with a compensation payment.

From 80 to 90 per cent of other respondents expressed a preference for spending money on reducing nuisances associated with a new waste disposal facility rather than paying compensation to people in the area, even when the payment was sufficient to make up for any loss in property values or was greater than the amount to be spent on the mitigating activities.

About 70 per cent of another group of survey respondents thought that a new business should spend a large sum of money on efforts that would only be partially effective in overcoming a relatively minor environmental problem, rather than accepting the business's offer to spend a like sum "on whatever use is decided on by local residents in a referendum."

These results are also consistent with findings of community preferences in dealing with waste disposal site selection (Zeiss, 1988). Compensation policies do not appear to carry the efficiency benefits often ascribed to them on the basis of valuation asymmetries.

The evidence that people value losses from a reference position much more than gains beyond it, may also have implications for a wide array of quota allocations and reallocations, issuing and termination of licenses, and treatment of people experiencing adverse impacts of changes.

The asymmetric valuation of gains and losses appears to be a major reason that people judge some actions as acceptable and fair and others as unacceptable and unfair (Kahneman, Knetsch, and Thaler, 1986). Changes or reallocations that are seen to impose a loss on one party for the benefit of another are very likely to be seen as unfair and therefore far less acceptable by a wide consensus of people that extends well beyond the individuals immediately involved. While the extent to which the views of a wider public should influence policies that have a larger impact on smaller groups is a continuing question, there seems to be surprisingly general agreement on the circumstances that make particular impositions of losses and conferring of gains more or less acceptable.

The asymmetric valuation of gains and losses suggests that policies might be more acceptable to the extent that they are seen, for example, as: undertaking more explicit and extensive measures to mitigate losses, combining offsetting gains with losses to reduce feelings of loss due to the changes, establishing a more visible link between current reductions and later

gains to the same individuals, breaking perceptions of gains of one group coming from losses imposed on another, and framing losses in terms of foregone gains or setting out changes that may be thought of as being less than permanent in nature. An example of the last of these is the usual lack of concern that typically accompanies loans of national art treasures as opposed to their sale to people planning to export them (Frey and Pommerehne, 1987).

Reference Points and Loss Measures

The valuation disparity results raise the important question of what people regard as their reference point in judging gains and losses. The reference position will, for example, determine whether people regard a change such as improving air quality as an improvement or as a mitigation of a past harm. That is, do people regard the present quality of air as the reference level, or is some notion of clean air their normal reference? The reference point actually used by people will in large part determine the most appropriate measure to use in each particular case.

A control program to reduce pollution, for example, is likely to be far more valuable, and more likely to be worth doing, if it is regarded by people as reducing a harm rather than an improvement. This greater value is due to people weighing reductions of losses more heavily than they do commensurate gains.

A common presumption is that the choice of measure is entirely dependent on existing legal entitlements: "the value of a resource ... will vary with the assignment of property rights" (Krutilla and Fisher, 1985, p. 36). It seems more likely that the choice of measure is more appropriately a matter of the reference point that people actually use (Knetsch, 1987).

Legal entitlements may or may not influence reference positions, but it is the reference point that likely determines the proper measure of the welfare change and the size of the gain or loss. An indication of this lack of determinateness of the legal regime was provided in a study of range laws in California (Ellickson, 1987). One half of a county operated under open range law and the other half under closed range. In spite of the opposite assignments of liability for any damages to crops done by cattle, and the fact that the laws were well known by local residents in both parts of the county, cattle owners were held responsible in all cases. The reference position seemed clearly to be consistent with crop damages caused by cattle being considered a loss despite the extant legal position.

Conclusions

In sum, the conventional assertion that values attached to gains and to commensurate losses are equivalent seems to be incorrect for at least a large class of cases. These are very

likely to include most environmental values.

There is little or no evidence to support the traditional view of equivalence, and there is a great deal of evidence to support the opposite view. However, there is continuing need for further tests and more studies of the implications of any disparities. Meanwhile, the continued use of the equivalence assumption may be imposing unnecessary costs. Environmental policies and allocations, and most people, are likely bearing more costs than they would with adoption of more appropriate assessments.

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